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# Keeping Quality of Kareish Chees as Affected with Added Certein Spices and Herbs Oil as Antifungal Agents.

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## ABSTRACT

Kariesh cheese was made from pasteurized cow skim milk, acidified by yoghurt starter divided into three equal parts in addition to the control. Three types of spices and herbs oils were added, namely: Nigella (Black cumin) oil, cumin oil and clove oil, 0.5%, 0.75% and 1.0% respectively. Kariesh cheese was analyzed for chemical, microbiological and sensory characteristics when fresh and during refrigerated storage (5±2°C) up to 30 days. Gross composition of the resultant cheese samples was within the Egyptian for kariesh cheese. The pH values were decreased during storage period in control, but all treatments had lower pH values with increase ratios of spices and herbs oils. Kariesh cheese made with yoghurt starter (control) had less total solids, pH values, but an increase in titratable acidity, fat, total protein, SN was detected during storage period. The highest values of SN, TS, fat and total protein were observed in treatments (T2 and T3), and increased during storage period. The total bacterial count ($\times 10^4$) in control (2.65), T1 (2.80, 2.05 and 2.25), T2 (2.60, 2.90 and 2.65) and T3 (2.50, 2.78 and 2.60) and increased gradually during the storage. Coliforms were not detected during storage period, mold and yeast content also were not detected when fresh cheese in control and all treatments, but at the end of the storage period they were lower in all treatments T1 (1.02, 0.76 and 0.35), T2 (0.95, 0.85 and 0.52) T3 (0.80, 0.60 and 0.30) compared to control (1.77). Sensory evaluation of fresh kariesh cheese manufactured by adding 0.75% and 1% oil (T1, T2 and T3) gained higher score for appearance, body and texture and flavor than control at fresh cheese.

## INTRODUCTION

Cheese is an important integral part of diet consumed in Egypt. It is consumed almost three times a day. There are many traditional local cheese types produced in local regions. Kariesh cheese is one of the most popular local types of fresh soft cheese of the Egyptian cities. The increasing demand for it by Egyptian consumers is mainly attributed to it is high protein content and low price. Kariesh cheese is made from defeated or skims cow or buffalo milk, or a mixture of both. Cow or buffalo are milked directly into special earthenware pots, which are kept undisturbed in a suitable place to allow the fat to rise to the surface forming a cream layer and the partly skimmed milk sours and clots, then the cream layer is removed, and the curd is poured onto a mat, which is tied and hung with its contents, to allow the whey drain until the desired texture of the cheese is obtained. Finally, the cheese cut into suitable pieces and salted then it is ready to be consumed as fresh cheese. The shelf life of the fresh cheese is between one and two weeks Aldo, *et al.,* (2013). It is generally made of raw skimmed buffaloes' or cow's milk, which is often of poor bacteriological quality owing to the high microbial load present in raw milk and the objectionable condition under which it was produced Salwa, *et al., (*2012). Kariesh cheese contains an amount of sugar, some water, soluble vitamins and most of calcium and phosphorus. The quality and composition of kariesh cheese may vary considerably due to such factors as the quality and composition of the clotted skimmed milk, the method of manufacture, the time required to complete the whey drain, the quality of salt added and the method of handling finished cheese (Aldo *et al*., 2013). A recent trend in cheese manufacture is the production of naturally flavoured cheese made in short time with highly nutritive value and good microbiological quality as for human consumption. (Hosny *et al.,* 2011). The shelf -life of refrigerated non-sterile dairy products, including cheese is generally limited to 1-3 wk (Salvador and Fiszman, 2004), depending upon the quality of the raw materials, processing conditions, and post processing conditions, and post processing handing.

Spices and herbs have played an important role in human life prehistoric times. They have been used not only for flavouring food but also for their antioxidative, preservative and medicinal properties. Food scientists found that spices, their essential oils and their extracts are the superior substances, which can be used as a substitute for the artificial hazardous preservatives. Some studies have reported the effect of some herbs and spices such as cinnamon, cloves, marjoram, mustard all spices, black cumin, cumin and organa in preventing growth and toxin production of *Aspergillus, Alternaria and Penicillium (Hassan and El- Deeb, 1988*$_a$. Spices and herbs are used in foods today mainly for their flavours and aroma. The flavour components, such as alcohols, aldehydes esters, terpenes, phenols and organic acids, have not yet been fully identified. In addition to imparting flavour, certain spices prolong the shelf-life of foods due to their bacteriostatic or bacterio-cidal activity, and some prevent rancidity by their antioxidant activity (Shelef *et al.,* 1980). Many plant essential oils of spices and herps are active against various food-borne bacteria and molds (antimicrobial activity) *(*Gould, 1996*)*, in some instances to be potent anticarcinogenic agents (Bowles and Juneja, 1998), and/ or reduce processing requirements for their elimination in foods. Generally, the extent of the inhibitory effect of the oils is attributed to the presence of aromatic nucleus containing a polar functional group.

This study was carried out to evaluate the effect of add different types of essential oils at various concentrations on the organoleptic properties, chemical, physical and shelf-life of Kareish cheese.

## MATERIALS AND METHODS

Three types of essential oils (Nigella (black cumin), Cinnamon, Clove, Cumin and Marjoram) were purchased from local market (Kafr El Sheikh, Egypt) and stored at 5 ±1 $^{o}$C

**Table 1. The common and scientific name of spices and herbs oils used in the study.**

| No. | Common name | Scientific name | Arabic name | Part used |
|---|---|---|---|---|
| 1 | Nigella (Black cumin) | *Nigalla sativa* | حبة البركة | Seeds |
| 2 | Cumin | *Cuminum cyminum* | الكمون | Seeds |
| 3 | Clove | *Syzygium aromaticum* | القرنفل | Flowers |

**Table 2. Characterization and antimicrobial constituents of some spices and herbs oils used in the study*.**

| No. | Common name | Compounds and chief constituents of essential oils | The chief constituent of essential oils** |
|---|---|---|---|
| 1 | Nigella(Black cumin) | Thymoquinone, Eugenol, Nigellone and Carminative. | Glucoside melanthin |
| 2 | Cumin | P-cymene, Cuminal, Pinene and α-Terpinol. | Cumin aldehyde |
| 3 | Clove | Eugenol, Acetyl eugenol and vanillin. | Eugenol, E.acetate |

***Adapted from Charlambous (1994).**

****The chief constituents of essential oils obtained from the essential oils (Guenther, 1949, 1950 and Grieve, 1992).**

Raw whole cow's milk used in the present study was collected from the herds of El-Karada Experimental Station, Kafr El-Sheikh Governorate. Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

Unsalted Kareish cheese was manufactured by the common procedure described by Fahmy, (1960). The milk was divided into 4 parts 5 kg each (control without additives and three coefficients for three types of oils were added by 0.5, 0.75% and 1%, respectively). The oil was mixed with cow skim milk, pasteurized and naturalized, then added 2% at starters and incubated at 37 ° C until full coagulation. The curd was scoop in the hoops of a suitable size and placed on a porous mat of cloth. The yoghurt was placed in the cloth to expel more whey. When the curd was fixed, it was cut into pieces and kept at refrigerator temperature at 5 ± 2 ° C and tested when fresh and after 7, 15 and 30 days of cold storage. The cheese yield was calculated based on the amount of innovative milk for the amount of fresh cheese.

Cheese samples were analyzed when fresh and after 7, 15, and 30 days of storage. Sample was thoroughly mixed in a ceramic jar and used for pH using pH meter (model SA 720). Titratable acidity, moisture, fat, ash, total solids, protein and soluble nitrogen were carried out according to the method described by *AOAC (2002)*.

Cheese samples were analyzed when fresh and after 7, 15, and 30 days of storage (5±2°C). Samples were prepared as described by Clark *et al*., (1978).

Total bacterial count (TBC) per gram of cheese was determined using nutrient agar (NA) medium (LAB M, Bury, England) according to (Olson *et al.,* 1978). The plates were incubated at 37 ± 1°C for 48 h. Total coliform on Violet Red Bile agar.

Molds and yeast count (MYC) was carried out on potato dextrose agar (PDA) medium according to Lück and Gavron, (1990). The plates were incubated at 24 ± 1°C for five days.

Cheese samples were organoleptically tested for flavor, body & texture and appearance by panel constituted from members of Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, and by some other consumers as described by Nelson and Trout, (1981). The scores of judging were 60 for flavor, 30 for body & texture and 10 for appearance.

All statistical analysis was performed using Statistical Package for Social Studies software (SPSS, 2007) at $P \leq 0.05$.

## RESULTS AND DISCUSSION

The chemical composition of fresh and stored kariesh cheese manufactured by adding a different ratio of spices and herbs oils is presented in Table (3). The results revealed that kariesh cheese made with yoghurt starter (control) and all treatments showed a decrease in pH values, but an increase in titratable acidity the values of pH showed slight decrease during storage at 5±2 °C up to one month in all treatments including control. Table (3) shows opposite trend of pH values with cheese acidity. These results remain in agreement with those given *by* Abou-Donia *et al.,* (1975*)*. The decrease in pH values during storage could be related to the hydrolysis occurred in lactose and protein contents. The results of the present study are in agreement with *EL*-Gzsawy *et al.* (2013*)* and Magdoub *et al.* (1995). The acidity values of Kareish treatments had the opposite trend of pH value in all treatments including control. The highest cheese acidity 0.58 % and 1.70% %, the lowest cheese moisture 79.30 % and 76.80 % at fresh and after 30 days of cold storage, respectively. It is apparent from Table 3 that the acidity of was significantly related to its moisture content during storage period, compared to the other cheese treatments. This might be explained by the fact that the development of acidity leads to expel the whey from the curd Effat *et al.,* (2001). Our data are different from those reported by *Abd El-Tawab et al., (1988)*. These differences might be attributed to the differences in the method of cheese manufacture and type of milk.

Data in Table (4) shows some chemical analysis including moisture, total solids (TS) and fat. The moisture content of cheese is related to its total solids content, which gradually increased during storage period. The moisture content in Kareish cheese treatments was increased with increasing oil percentage. On the other hand, the moisture content decreased after 30 days of storage in all treatments due to the development of acidity. These results agree with Youssef *et al.* (1981). Statistical analysis of moisture values indicated a significant difference at among ($p \leqslant 0.05$) Kareish treatments and during pickling process (storage period). Total solids content (T.S %) of cheese shown in Table (4). They were 21.20

%, (21.10, 20.80 and 20.70 %), (21.30, 20.90 and 20.80%) and (21.50, 20.92 and 20.85%) at fresh for control and treatments T1, T2 and T3, respectively, and increased gradually to 23.00 %, (23.10, 23.15 and 23.20 %), (23.00, 23.12, and 23.20%) and (23.12, 23.20 and 23.25%) at the end of storage period (30 days) for cheese control and T1, T2 and T3 respectively. Also, Kareish cheese made with starter and oils (T1, T2 and T3) was characterized by low contents of fat. The changes in fat content of kariesh cheese during storage at refrigerator temperature are shown in Table (4). The average fat content was about 1 to % 1.95% in all treatments at fresh cheese. The fat content increased during storage of cheese from the control and all treatments.

Results presented in Table (5) indicate that total protein (TP), soluble nitrogen (SN) and ash content of Kareish cheese samples manufactured. Total protein content (TP %) shown in Table (5) was 15.15%, (15.00, 15.10 and 15.10 %), (15.10,15.08 and 15.00%) and (15.15, 15.00 and 15.10%) at zero time for control, T1, T2 and T3, respectively, and increased gradually to 15.65%, (15.60, 15.70 and 15.65%), (15.70, 15.73 and 15.70%) and (15.75, 15.72 and 15.73%) at the end of storage period (30 days) for cheese control, T1, T2 and T3, respectively. On the other hand, Total protein of all treatments including control was increased in cheese after 30 days. Youssef *et al. (*1981) found that pickling of kareish cheese for 4 weeks increased total nitrogen. Data in Table (5) show also cheese soluble nitrogen (SN) content during storage period. Slight differences were found between the control cheese and other treatments When it was fresh and after the end of the storage period. A gradual increase in SN was observed in cheese from all treatments until the end of storage. This increase might be attributed to the proteolysis of protein during storage. Our results are in accordance with those obtained by El-Shafei *et al., (*2008) and Mahmoud *et al*., (2013) who found similar trend and directly linked the increase of Kareish cheese SN to storage period. The data indicated also that during storage the ash content increased in all treatments including control. This increase could be due to the decrease in moisture content occurred in all treatments.

Table (6) shows the changes in total bacteria count (TBC) of different kareish cheeses treatments during storage period at refrigerator. From the results it could be seen that a gradual increase in TBC was observed throughout the storage period in all treatments. TBC in fresh and cold stored cheeses are shown in Table (6). No significant differences were found in fresh cheeses ($2.65 \times 10^4$), ($2.40 \times 10^4$ ,$2.35 \times 10^4$, $2.25 \times 10^4$), ($2.30 \times 10^4$, $2.25 \times 10^4$, $2.20 \times 10^4$) and ($2.20 \times 10^4$, $2.18 \times 10^4$, $2.15 \times 10^4$) CFU/gram cheese for control and treatments T1, T2, and T3, respectively. The increase of the storage period led to gradual. TBC increase in all cheese treatments, however the increasing rate was less in treatments T1, T2 and T3 as compared to control. The control cheese had higher TBC as compared to other treatments at the end of storage period ($6.90 \times 10^4$), ($6.60 \times 10^4$, $6.30 \times 10^4$, $6.20 \times 10^4$), ($6.50 \times 10^4$, $6.45 \times 10^4$, $6.3 \times 10^4$) and ($6.40 \times 10^4$, $6.30 \times 10^4$, $6.10 \times 10^4$) CFU/gram cheese for control and treatments T1, T2, and T3, respectively). The reduction in TBC for (T1, T2 and T3) treatments can be attributed to degradation in the protein that may produce active antimicrobial peptides or the production of antifungal and yeast components from the spices and herbs used in the cheese industry.

**Table 3. pH and titratable acidity of Kareish cheeses manufactured with added some spices and herbs oil. (Average ±SE of 3 replicates)**

| Storage period | Treatments* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | T1 | | | T2 | | | T3 | | |
| | | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% |
| | pH values | | | | | | | | | |
| Fresh | $4.90^{a}$±0.09 | $4.91^{b}$±0.09 | $4.91^{b}$±0.08 | 4.89a±0.05 | $4.90^{a}$±0.08 | $4.93^{bc}$±0.05 | $4.^{97bc}$±0.02 | $4.91^{b}$±0.07 | $4.93^{bc}$±0.09 | $4.85^{ab}$±0.02 |
| 7 days | $4.58^{c}$±0.05 | $4.55^{a}$±0.04 | $4.59^{c}$±0.05 | $4.50^{bc}$±0.02 | $4.52^{a}$±0.07 | $4.50^{b}$±0.05 | $4.58^{bc}$±0.08 | $4.58^{c}$±0.03 | $4.51^{a}$±0.06 | $4.50^{b}$±0.07 |
| 15 days | $4.40^{a}$±0.06 | $4.42^{b}$±0.02 | $4.40^{a}$±0.03 | $4.42^{a}$±0.04 | $4.48^{bc}$±0.02 | $4.40^{a}$±0.06 | $4.43^{b}$±0.05 | $4.42^{a}$±0.08 | $4.43^{b}$±0.05 | $4.40^{a}$±0.03 |
| 30 days | $4.20^{b}$±0.06 | $4.16^{ab}$±0.08 | $4.12^{bc}$±0.02 | $4.17^{ab}$±0.03 | $4.19^{b}$±0.04 | $4.18^{b}$±0.06 | $4.12^{bc}$±0.05 | $4.18^{b}$±0.06 | $4.15^{a}$±0.03 | $4.16^{a}$±0.03 |
| | Acidity % | | | | | | | | | |
| Fresh | $0.60^{a}$±0.04 | $0.61^{a}$±0.08 | $0.61^{a}$±0.04 | $0.62^{b}$±0.07 | $0.60^{a}$±0.04 | $0.60^{a}$±0.04 | $0.58^{b}$±0.02 | $0.60^{a}$±0.01 | $0.62^{b}$±0.08 | $0.58^{b}$±0.04 |
| 7 days | $0.90^{a}$±0.02 | $0.90^{a}$±0.05 | $0.86^{b}$±0.02 | $0.88^{b}$±0.04 | $0.90^{a}$±0.06 | $0.86^{b}$±0.05 | $0.92^{b}$±0.02 | $0.90^{a}$±0.04 | $0.88^{b}$±0.02 | $0.92^{a}$±0.03 |
| 15 days | $1.10^{b}$±0.03 | $1.20^{bc}$±0.06 | $1.24^{bc}$±0.02 | $1.22^{ab}$±0.02 | $1.18^{ab}$±0.03 | $1.28^{bc}$±0.02 | $1.15^{bc}$±0.05 | $1.20^{bc}$±0.03 | $1.24^{ab}$±0.01 | $1.16^{bc}$±0.04 |
| 30 days | $1.60^{ab}$±0.03 | $1.68^{bc}$±0.04 | $1.70^{ab}$±0.03 | $1.66^{bc}$±0.05 | $1.68^{ab}$±0.02 | $1.70^{bc}$±0.03 | $1.66^{c}$±0.02 | $1.67^{c}$±0.04 | $1.70^{ab}$±0.06 | $1.65^{bc}$±0.08 |

**Data are mean ± SE for 3 replicates. Averages with different superscripts differed significantly (P≤0.05). *T1: Kareish cheeses treatments with added Nigella (Black cumin) oil. T2: Kareish cheeses treatments with added Cumin oil. T3: Kareish cheeses treatments with added Clove.**

On the other hand, control had the lowest total count had the lowest total bacterial count when fresh and during the storage period. Data showed a deferent between cultures, storage period, the total microbial in kariesh cheese treatments. In all treatments, total bacteria count reduced during the storage period. This may be attributed to the effect of high acidity on the different microbial groups Abou Dawood, (2002). It could also be observed that none of the different cheese treatments contained any of staphylococcal, mould and yeast and coliform microorganisms during the present work. this may be due to the high heat treatment applied and high technology used. All samples of Kareish cheese either fresh or stored were completely free of coliform bacteria. This could due to the efficient heat treatment and good sanitation conditions applied during manufacture and storage of cheese samples. These results are in agreement with the results of Monzano *et al.* (1992). The resultant cheese was

characterized by the presence of negligible levels of coliform. It is clear that yeasts and molds could not be detected in fresh samples. However, the counts started to be detected and counted after 15 days in all treatments including control. These results are in line with the results reported by Mehanna *et al.* (2002) who found that the yeast and mold of soft cheese began to appear after 7 days of storage.

**Table 4. Chemical composition of Kareish cheeses with added some spices and herbs oil (Average ±SE of 3 replicates)**

| Storage period | Treatments* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | T1 | | | T2 | | | T3 | | |
| | | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% |
| | Moisture % | | | | | | | | | |
| Fresh | 78.80$^{b}$±0.51 | 78.90$^{b}$±0.48 | 79.20$^{ab}$±0.50 | 79.30$^{ab}$±0.42 | 78.70b$^{b}$±0.50 | 79.10$^{b}$±0.45 | 79.20$^{b}$±0.50 | 78.50a±0.48 | 79.08$^{b}$±0.42 | 79.15ab±0.48 |
| 7 days | 77.50$^{a}$±0.55 | 77.90$^{a}$±0.52 | 78.00$^{a}$±0.45 | 77.50$^{a}$±065 | 77.90$^{a}$±0.50 | 78.10$^{b}$±0.48 | 78.15$^{b}$±0.52 | 78.50$^{ab}$±0.65 | 78.90$^{b}$±0.51 | 78.20$^{b}$±0.65 |
| 15 Days | 77.25$^{b}$±0.40 | 77.30$^{b}$±0.42 | 77.60$^{b}$±042 | 77.25$^{b}$±0.50 | 77.60$^{b}$±0.43 | 77.80$^{a}$±0.48 | 77.90$^{a}$±0.52 | 77.05$^{bc}$±0.50 | 77.10$^{bc}$±0.42 | 77.50$^{b}$±0.48 |
| 30 days | 77.00$^{ab}$±0.20 | 76.90$^{b}$±0.12 | 76.85$^{b}$±0.20 | 76.80$^{b}$±0.22 | 77.00$^{ab}$±0.18 | 76.88$^{ab}$±0.16 | 76.80$^{b}$±0.17 | 76.88$^{ab}$±0.22 | 76.80$^{b}$±0.23 | 76.75$^{ab}$±0.18 |
| | T.S % | | | | | | | | | |
| Fresh | 21.20$^{a}$±0.32 | 21.10$^{a}$±0.35 | 20.80$^{a}$±0.28 | 20.70$^{a}$±0.30 | 21.30$^{a}$±0.27 | 20.90$^{ab}$±0.32 | 20.80$^{ab}$±0.27 | 21.50$^{a}$±0.31 | 20.92$^{ab}$±0.22 | 20.85$^{ab}$±0.36 |
| 7 days | 22.50$^{a}$±0.48 | 22.10$^{a}$±0.52 | 22.00$^{a}$±0.45 | 22.50$^{a}$±050 | 22.10$^{a}$±0.52 | 21.90$^{b}$±0.45 | 21.85$^{b}$±041 | 21.50$^{ab}$±0.53 | 22.10$^{a}$±0.48 | 21.80$^{b}$±0.54 |
| 15 days | 22.75$^{b}$±0.02 | 22.70$^{b}$±0.03 | 22.40$^{b}$±0.02 | 22.75$^{b}$±0.07 | 22.40$^{b}$±0.03 | 22.20$^{b}$±0.06 | 22.10$^{b}$±0.03 | 22.95$^{ab}$±0.10 | 22.90$^{b}$±0.04 | 22.50$^{b}$±0.08 |
| 30 days | 23.00$^{ab}$±0.48 | 23.10$^{a}$±0.42 | 23.15$^{a}$±0.44 | 23.20$^{a}$±0.52 | 23.00$^{ab}$±042 | 23.12$^{b}$±0.46 | 23.20$^{a}$±0.42 | 23.12$^{ab}$±0.45 | 23.20$^{ab}$±0.40 | 23.25$^{ab}$±0.45 |
| | Fat% | | | | | | | | | |
| Fresh | 1.00$^{b}$±0.50 | 1.30$^{a}$±0.50 | 1.55$^{a}$±0.55 | 1.80$^{a}$±0.39 | 1.30$^{a}$±0.50 | 1.60$^{a}$±0.55 | 1.90$^{a}$±0.35 | 1.20$^{b}$±0.50 | 1.60$^{a}$±0.55 | 1.95±0.39 |
| 7 days | 1.20$^{a}$±0.32 | 1.50$^{a}$±0.30 | 1.70$^{b}$±0.38 | 2.00$^{ab}$±0.22 | 1.60$^{b}$±0.32 | 1.60$^{b}$±0.12 | 2.10$^{bc}$±0.42 | 1.50$^{a}$±0.30 | 1.70$^{b}$±0.20 | 2.10$^{ab}$±0.34 |
| 15 days | 1.30$^{a}$±0.02 | 1.70$^{b}$±0.10 | 1.80$^{b}$±0.12 | 2.10$^{ab}$±0.02 | 1.80$^{b}$±0.04 | 1.90$^{b}$±0.09 | 2.20$^{bc}$±0.12 | 1.80$^{b}$±0.32 | 1.90$^{b}$±0.02 | 2.15$^{bc}$±0.08 |
| 30 days | 1.50$^{a}$±0.40 | 1.80$^{b}$±0.38 | 1.90$^{b}$±0.40 | 2.15$^{ab}$±0.35 | 1.95$^{b}$±0.38 | 2.10$^{ab}$±0.42 | 2.35$^{bc}$±0.40 | 1.90$^{b}$±0.37 | 2.10$^{a}$b±0.30 | 2.45$^{bc}$±0.42 |

**Data are mean ± SE for 3 replicates. *See legend to Table (3) for details.**
**Averages with different superscripts differed significantly (P≤0.05).**

**Table 5. Chemical composition of Kareish cheeses made from cow skim milk with added some spices and herbs oil (Average ±SE of 3 replicates)**

| Storage period | Treatments* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | T1 | | | T2 | | | T3 | | |
| | | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% |
| | Protein % (T.P) | | | | | | | | | |
| Fresh | 15.15$^{a}$±0.03 | 15.00$^{a}$±0.02 | 15.10$^{a}$±0.03 | 15.00$^{a}$±0.01 | 15.10$^{a}$±0.02 | 15.08$^{a}$±0.05 | 15.00$^{a}$±0.02 | 15.15$^{a}$±0.03 | 15.00$^{a}$±0.07 | 15.10$^{a}$±0.04 |
| 7 days | 15.20$^{a}$±0.08 | 15.20$^{a}$±0.02 | 15.30$^{b}$±0.05 | 15.10$^{a}$±0.06 | 15.15$^{a}$±0.02 | 15.25$^{b}$±0.04 | 15.10$^{a}$±0.08 | 15.20$^{b}$±0.06 | 15.10$^{a}$±0.03 | 15.15$^{a}$±0.07 |
| 15 days | 15.50$^{b}$±0.12 | 15.50$^{b}$±0.10 | 15.60$^{b}$±0.22 | 15.50$^{b}$±0.09 | 15.55$^{b}$±0.25 | 15.56$^{b}$±0.22 | 15.50$^{b}$±0.09 | 15.60$^{b}$±0.15 | 15.60$^{b}$±0.18 | 15.50$^{b}$±0.28 |
| 30 days | 15.65$^{a}$±0.32 | 15.60$^{a}$±0.30 | 15.70$^{b}$±0.22 | 15.65$^{a}$±0.42 | 15.70$^{b}$±0.30 | 15.73$^{b}$±0.24 | 15.70$^{b}$±0.36 | 15.75$^{b}$±0.30 | 15.72$^{b}$±0.42 | 15.73$^{b}$±0.52 |
| | SN % | | | | | | | | | |
| Fresh | 0.42$^{a}$±0.02 | 0.42$^{a}$±0.02 | 0.46$^{a}$±0.01 | 0.45$^{a}$±0.03 | 0.41$^{a}$±0.01 | 0.44$^{a}$±0.01 | 0.42$^{a}$±0.02 | 0.42$^{a}$±0.03 | 0.42$^{a}$±0.02 | 0.43$^{a}$±0.01 |
| 7 days | 0.46$^{a}$±0.01 | 0.48$^{b}$±0.01 | 0.49$^{b}$±0.03 | 0.48$^{b}$±0.01 | 0.44$^{a}$±0.02 | 0.46$^{a}$±0.01 | 0.47$^{b}$±0.02 | 0.46$^{a}$±0.01 | 0.48$^{b}$±0.01 | 0.45$^{a}$±0.03 |
| 15 days | 0.52$^{b}$±0.03 | 0.56$^{b}$±0.01 | 0.55$^{b}$±0.02 | 0.52$^{b}$±0.01 | 0.57$^{b}$±0.01 | 0.59$^{b}$±0.03 | 0.56$^{a}$±0.03 | 0.55$^{a}$±0.02 | 0.54$^{a}$±0.02 | 0.57$^{b}$±0.01 |
| 30 days | 0.65$^{b}$±0.02 | 0.66$^{b}$±0.02 | 0.68$^{a}$±0.03 | 0.69$^{a}$±0.01 | 0.70$^{a}$±0.02 | 0.67$^{a}$±0.03 | 0.70$^{a}$±0.01 | 0.65$^{b}$±0.02 | 0.68$^{b}$±0.04 | 0.73$^{ab}$±0.01 |
| | Ash % | | | | | | | | | |
| Fresh | 2.04$^{b}$±0.10 | 2.10$^{b}$±0.05 | 2.02$^{b}$±0.08 | 2.05$^{b}$±0.04 | 2.00$^{b}$±0.02 | 2.04$^{b}$±0.04 | 2.06$^{b}$±0.06 | 2.00$^{b}$±0.01 | 2.01$^{b}$±0.06 | 2.00$^{a}$±0.02 |
| 7 days | 2.15$^{a}$±0.20 | 2.11$^{a}$±0.10 | 2.12$^{a}$±0.20 | 2.17$^{a}$±0.15 | 2.10$^{a}$±0.18 | 2.15$^{a}$±0.10 | 2.17$^{a}$±0.20 | 2.11$^{a}$±0.16 | 2.13$^{a}$±0.10 | 2.12$^{a}$±0.17 |
| 15 days | 2.22$^{b}$±0.15 | 2.20$^{b}$±0.10 | 2.$^{2b}$l±0.10 | 2.25$^{b}$±0.20 | 2.18$^{a}$±0.15 | 2.22$^{b}$±0.10 | 2.25$^{b}$±0.14 | 2.18$^{a}$±0.12 | 2.20$^{b}$±0.15 | 2.20$^{b}$±0.16 |
| 30 days | 2.35$^{a}$±0.10 | 2.32$^{a}$±0.12 | 2.30$^{a}$±0.10 | 2.38$^{a}$±0.14 | 2.30$^{b}$±0.10 | 2.36$^{a}$±0.10 | 2.39$^{ab}$±0.12 | 2.30$^{a}$±0.12 | 2.34$^{b}$±0.11 | 2.35$^{a}$±0.11 |

**Data are mean ± SE for 3 replicates. *See legend to Table (3) for details.**
**Averages with different superscripts differed significantly (P≤0.05).**

**Table 6. Effect of some spices and herbs oil on the growth of some microorganisms in Kareish cheeses (log cfu/ml) when fresh and during storage. (Average ±SE of 3 replicates).**

| Storage period | Treatments* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | T1 | | | T2 | | | T3 | | |
| | | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% |
| | Total Bacterial Count ($\times 10^4$) | | | | | | | | | |
| Fresh | 2.65$^{a}$±0.01 | 2.40$^{a}$±0.03 | 2.35$^{a}$±0.01 | 2.25$^{a}$±0.02 | 2.30$^{a}$±0.02 | 2.25$^{a}$±0.04 | 2.20$^{a}$±0.01 | 2.20$^{a}$±0.03 | 2.18$^{a}$±0.02 | 2.15$^{a}$±0.02 |
| 7 days | 2.95$^{a}$±0.03 | 2.75$^{b}$±0.01 | 2.65$^{b}$±0.02 | 2.45$^{b}$±0.01 | 2.50$^{b}$±0.01 | 2.50$^{b}$±0.03 | 2.55$^{b}$±0.05 | 2.65$^{b}$±0.03 | 2.37$^{a}$±0.04 | 2.45$^{b}$±0.01 |
| 15 days | 5.70$^{b}$±0.02 | 4.90$^{b}$±0.04 | 4.60$^{a}$±0.4 | 4.26$^{b}$±0.02 | 4.60$^{b}$±0.01 | 5.00$^{a}$±0.1 | 4.30$^{b}$±0.03 | 4.65$^{b}$±0.04 | 4.40$^{b}$±0.02 | 4.20$^{a}$±0.03 |
| 30 days | 6.90$^{b}$±0.04 | 6.60$^{b}$±0.03 | 6.30$^{a}$±0.02 | 6.20$^{a}$±0.03 | 6.50$^{a}$±0.01 | 6.45$^{a}$±0.02 | 6.30$^{a}$±0.02 | 6.40$^{a}$±0.03 | 6.30$^{a}$±0.01 | 6.10$^{b}$±0.01 |
| | Mold and Yeast ($\times 10^2$) | | | | | | | | | |
| Fresh | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 7 days | 0.30$^{c}$±0.01 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 15 days | 1.60$^{ab}$±0.03 | 0.25$^{c}$±0.01 | 0.13$^{c}$±0.02 | ND$^{a}$ | 0.20$^{b}$±0.01 | 0.15$^{c}$±0.01 | ND$^{a}$ | 0.25$^{b}$±0.02 | ND$^{a}$ | ND$^{a}$ |
| 30 days | 1.77$^{b}$±.02 | 1.02$^{b}$±0.04 | 0.76$^{b}$±0.01 | 0.35$^{a}$±0.02 | 0.95$^{bc}$±0.04 | 0.85$^{bc}$±0.02 | 0.52$^{b}$±0.03 | 0.80$^{bc}$±0.05 | 0.60$^{b}$±0.01 | 0.30$^{a}$±0.03 |

**Data are mean ± SE for 3 replicates. *See legend to Table (3) for details. **ND: Not detected.**
**Averages with different superscripts differed significantly (P≤0.05).**

The data in the same table illustrated that the yeast and mold count of all kareish cheese samples increased during storage at refrigerator.

Kariesh cheeses was evaluated for appearance and body & texture and flavour. Data pertaining to the overall evaluation and preference of fresh kariesh cheese are depicted in Table (7). Results of the sensory evaluation of fresh kariesh cheese manufactured by adding 0.5%, 0.75% and 1% oils treatments T3, T2 and T1 gained higher score for appearance, body and texture and flavour than control at zero time. Adding different ratio of oil were the principal factors influencing the sensory properties of prepared cheeses. Kariesh cheese made from with different oils and yoghurt starter had a good quality (soft and moist texture and flavour). The results indicate that the addition of oils was enough to obtained kariesh cheese with a good quality near to that made from yoghurt starter only without oil addition.

Finally, from the fore mentioned results, it can be recommended that some naturally essential oils gave good sensory characteristics when used at the certain concentrations in kariesh cheese. Also, it can be successfully applied to increase the shelf life of kariesh cheese made with the specific concentrations of those oils until 20-30 days of storage at the refrigeration temperature. Further research might be necessary to study the application of these essential oils in combination with each other and other natural preservatives, and also investigate the effect of these oils on the spoilage in other types of dairy foods.

**Table 7. Sensory evaluation of Kareish cheeses manufactured with added some spices and herbs oil. (Average ±SE of 3 replicates).**

| Storage period | Treatments* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | T1 | | | T2 | | | T3 | | |
| | | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% | 0.5% | 0.75% | 1% |
| | Fresh | | | | | | | | | |
| Appearance (10) | 8.30$^{a}$±0.25 | 8.31$^{a}$±0.22 | 8.30$^{a}$±0.20 | 8.50$^{a}$±0.20 | 8.32$^{a}$±0.25 | 8.50$^{a}$±0.22 | 8.62$^{a}$±0.21 | 8.30$^{a}$±0.20 | 8.65$^{a}$±0.25 | 8.88$^{b}$±0.23 |
| Body& Texture (30) | 27.50$^{b}$±0.42 | 28.30$^{b}$±0.38 | 28.35$^{b}$±0.32 | 28.52$^{b}$±0.30 | 28.36$^{b}$±0.34 | 28.56$^{b}$±0.30 | 28.72$^{b}$±0.31 | 28.60$^{b}$±0.42 | 28.74$^{ab}$±0.39 | 28.92$^{bc}$±0.33 |
| Flavor (60) | 55.60$^{e}$±0.40 | 56.80$^{e}$±0.41 | 56.78$^{e}$±0.48 | 57.00$^{c}$±0.46 | 56.72$^{e}$±0.52 | 57.10$^{c}$±0.44 | 57.22$^{c}$±0.50 | 56.92$^{e}$±0.40 | 57.30$^{c}$±0.42 | 57.50$^{c}$±0.52 |
| Total (100) | 91.40$^{b}$±1.25 | 93.41$^{a}$±1.19 | 93.43$^{a}$±1.15 | 94.02a$^{ab}$±1.20 | 93.20$^{a}$±1.05 | 94.16$^{ab}$±1.07 | 94.56$^{ab}$±0.85 | 93.82$^{a}$±0.80 | 94.69$^{ab}$±1.20 | 95.30$^{bc}$±1.35 |

**Data are mean ± SE for 3 replicates.** ***See legend to Table (3) for details**
**Averages with different superscripts differed significantly (P≤0.05).**

## CONCLUSION

Previous results that can produce high quality cheesecake cheese and accept the use of some spices and herb oils can be recommended. The finished product showed improved body texture, better cheese flavor. Moreover, prolong the life of the cheese.

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## استخدام بعض زيوت التوابل والاعشاب كمضادات للفطريات و أثر ذلك على جودة الجبن القريش

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تم دراسة تاثير اضافة ثلاثة تركيزات (٠,٥ ، ٠,٧٥ ، ١%) من ثلاثة أنواع من زيوت التوابل و الأعشاب ( زيت حبة البركة- زيت الكمون- زيت القرنفل) للجبن القريش المصنع من اللبن البقرى الفرز المبستر بالطريقة التقليدية. كشفت الأختبارات الحسية و الكيماوية و البكتريولوجية التى أجريت على الجبن الناتج أن استخدام هذة الزيوت فى صناعة الجبن القريش حسنت من صفات و خواص الجبن الناتج و كانت أكثر قبولا من جبن الكنترول و خاصة عند التركيزات الأعلى (٠,٧٥ ، ١%). أيضا تميزت الجبن الناتج بالتركيب الناعم و القوام الأكثر طراوة وكذلك اللون الأكثر بياضا عن جن الكنترول. علاوة على ذلك زيادة قوة حفظ الجبن بالثلاجة بمقدار ١٠-١٥ يوم عن جبن المقارنة.